DOCUMENT RESUME

ED 070 029 CG 007 758

AUTHOR	Allen, Vernon L.; Feldman, Robert S.
TITLE	Learning Through Tutoring: Low-Achieving Childern as Tutors.
INSTITUTION	Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
SPONS AGENCY	National Center for Educational Research and Development (DHEW/OE), Washington, D.C.
REPORT NO	WRDCCL-TR-236
BUREAU NO	BR-5-0216
PUB DATE	Sep 72
CONTRACT	OEC-5-10-154
NOTE	17p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Academic Achievement; *Cross Age Teaching; *Elementary Education; *Elementary School Students; *Low Achievers; *Tutorial Programs; Tutoring

ABSTRACT

Low-achieving fifth-grade children either taught a third grader or studied alone for a series of daily sessions. At the end of the two-week period, the low-achievers' performance was significantly better in the tutoring condition than in the studying condition. This showed a reversal in the direction from the initial difference between conditions. There was no differential effect on tutees of being taught versus studying alone. Results suggest that serving as a tutor may be a particularly useful method for enhancing the academic performance of low-achieving children. (Author/WS)

ED 070029

TECHNICAL REPORT NO. 236

LEARNING THROUGH TUTORING: LOW-ACHIEVING CHILDREN AS TUTORS

REPORT FROM THE PROJECT ON CONDITIONS OF LEARNING AND INSTRUCTION

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WISCONSIN RESEARCH AND DEVELOPMENT
CENTER FOR COGNITIVE LEARNING

THE UNIVERSITY OF WISCONSIN
Madison, Wisconsin

U. S. Office of Education
Center No. C-03
Contract OE 5-10-154

PUBLICATIONS OFFICE

UNIVERSITY OF WISCONSIN

RESEARCH COGNITIVE LEARNING DEVELOPMENT

ED 070029

Technical Report No. 236

LEARNING THROUGH TUTORING: LOW-ACHIEVING CHILDREN AS TUTORS

by

Vernon L. Allen and Robert S. Feldman

Report from the Project on
Conditions of Learning and Instruction

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September 1972

Published by the Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and development center by funds from the United States Office of Education, Department of Health, Education, and Welfare. The opinions expressed herein do not necessarily reflect the position or policy of the Office of Education and no official endorsement by the Office of Education should be inferred.

Center No. C-03 / Contract OE 5-10-154

Statement of Focus

Individually Guided Education (IGE) is a new comprehensive system of elementary education. The following components of the IGE system are in varying stages of development and implementation: a new organization for instruction and related administrative arrangements; a model of instructional programing for the individual student; and curriculum components in prereading, reading, mathematics, motivation, and environmental education. The development of other curriculum components, of a system for managing instruction by computer, and of instructional strategies is needed to complete the system. Continuing programmatic research is required to provide a sound knowledge base for the components under development and for improved second generation components. Finally, systematic implementation is essential so that the products will function properly in the IGE schools.

The Center plans and carries out the research, development, and implementation components of its IGE program in this sequence: (1) identify the needs and delimit the component problem area; (2) assess the possible constraints—financial resources and availability of staff; (3) formulate general plans and specific procedures for solving the problems; (4) secure and allocate human and material resources to carry out the plans; (5) provide for effective communication among personnel and efficient management of activities and resources; and (6) evaluate the effectiveness of each activity and its contribution to the total program and correct any difficulties through feedback mechanisms and appropriate management techniques.

A self-renewing system of elementary education is projected in each participating elementary school, i.e., one which is less dependent on external sources for direction and is more responsive to the needs of the children attending each particular school. In the IGE schools, Center-developed and other curriculum products compatible with the Center's instructional programing model will lead to higher student achievement and self-direction in learning and in conduct and also to higher morale and job satisfaction among educational personnel. Each developmental product makes its unique contribution to IGE as it is implemented in the schools. The various research components add to the knowledge of Center practitioners, developers, and theorists.

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Abstract

Low-achieving fifth-grade children either taught a third grader or studied alone for a series of daily sessions. At the end of the two-week period, the low-achievers' performance was significantly better in the tutoring condition than in the studying alone condition—a reversal in direction of the initial difference between conditions. There was no differential effect on tutees of being taught versus studying alone. Results suggest that serving as a tutor may be a particularly useful method for enhancing the academic performance of low-achieving children.

1
Introduction

Tutoring has long been acknowledged as a useful method for providing individualized instruction and for enhancing the performance of students needing additional help with their school work. Teachers traditionally have tapped one readily accessible source for obtaining tutors—capable children in the classroom. The tutee obviously benefits from being helped by another child, but perhaps less obviously the child who enacts the role of teacher—the tutor—may himself profit as well. A common experience of teachers is the feeling that they learn a great deal themselves from the process of teaching. Similar positive consequences from teaching might be expected to occur for the tutor when one child helps another child in his work.

Recent experimental evidence indicates that a positive effect on learning does indeed occur for the child who enacts the role of teacher; in fact, the tutor may benefit more than the tutee in many cases. For instance, Cloward (1967) found that over a seven-month period tenth and eleventh graders who had tutored younger children showed a significantly greater increase in reading achievement scores than a comparable control group that did not tutor. Furthermore, the tutors' gain in reading scores was even greater than the tutees' improvement. Abundant anecdotal evidence suggests that the tutor may profit in several ways from his involvement in teaching; the tutor's motivation, sense of responsibility, and attitude toward school may show a positive shift. Encouraged by the prospect of positive effects when using older children to teach younger children, many schools have recently initiated some form of tutoring program (Gartner, Kohler, & Riessman, 1971). Yet, little in the way of systematic theory and research is available in this area.

A more satisfactory understanding of the psychological processes involved in the tutor-tutee relationship may be gained by using a general theoretical framework. A role theory analysis (Sarbin & Allen, 1968) would seem to be directly applicable to research in tutoring. One of the predictions of role theory is that enactment of a role produces changes in self-concept, attitudes, cognitions, and behavior consistent with role expectations. Empirical data demonstrate that role enactment does produce behavioral and attitudinal changes in the person enacting a role (Lieberman, 1956; Waller, 1932). Role theory has the advantage of specifying the variables that determine amount of change produced by role enactment—for example, clarity of role expectations, role-taking skill, and involvement in the role. Role theory would account for the effects of tutoring on the tutor as consequences of enacting the role of teacher, in much the same way that enacting any role produces behavioral changes consistent with role expectations.

Let us look closely at the role of teacher in terms of its effects on learning, since the present study is concerned only with the impact of tutoring on the tutor's learning and not with subjective measures such as attitudes. Successful enactment of the role of teacher (or tutor) requires that a person engage in behavior clearly distinguishable from the behavior of a person enacting the role of student (or tutee). First, it is necessary for a teacher to adopt a completely different point of view from that taken by a student. It is thus likely that a restructuring and reorganizing of the material to be taught will occur when a person enacts the role of teacher. Another critical aspect of the teacher role is the requirement that one thoroughly master the material to be taught. An important motivational factor is added by the possibility of embarrassment in the presence of the student should the teacher not know the material well. Also, since teachers are generally understood to be

authority figures, role enactment may increase self-esteem and produce positive attitudes toward school and teachers. All these factors intrinsic to the role of teacher should facilitate the learning of material when one acts as a tutor.

Enacting the role of teacher might be a particularly effective means of producing an increase in learning for low-achieving children; they probably have experienced failure repeatedly and tend to be passive participants in any learning situation. The present experiment tests the hypothesis that low-achieving children will learn more when placed in the role of teacher than when spending the same amount of time studying alone. It is predicted that the tutee will benefit from tutoring as well; however, the relative superiority of tutoring over studying alone should be even greater for the tutor than for the tutee. To provide a rigorous test of this hypothesis, a short-term laboratory study was designed that allowed a much greater degree of control over extraneous factors than would have been possible in an actual school setting.

The control condition used for assessing the effect of tutoring in the present study differs from the control condition usually employed in tutoring research. Typically, the effects of tutoring are evaluated by comparison with a group of children who did not receive any special treatment at all. A more reasonable comparison group for evaluating the effects of tutoring would be a group that spends the same amount of time studying the material by themselves. Certainly this control condition imposes a more strenuous test for evaluating the outcome of tutoring than is found in the type of control condition traditionally used in this area. Moreover, for purposes of application to the school setting, one would like to know whether tutoring produces performance superior to solitary study of the same material.

The present study also attempts to determine whether tutors cognitively restructure the material in anticipation of teaching it to someone else. Such reorganization and restructuring of material may be one of the mechanisms through which improvement in learning occurs as a consequence of enacting the role of teacher.

II
Method

Subjects

Tutors

Subjects who acted as tutors were ten low-achieving fifth graders whose reading scores were at least one year below grade level. Identified by their school principals, subjects were recruited by mail and volunteered to participate in an unspecified tutoring program. Eight subjects were boys and two were girls. Each subject was paid $10 for participating in ten 45-minute sessions over a two-week period during summer vacation. Three subjects were dropped from the final analysis, one for not completing all sessions and two for not following experimental instructions.

Tutees

Tutees were ten randomly-selected third graders, eight boys and two girls. Subjects were recruited by mail from a randomly-selected group of third-grade public school students and paid $10 each. Tutees were assigned to one same-sex tutor for the entire two-week period. Data from three tutees were excluded from the analysis because their corresponding tutor was dropped.

Materials

Ten different lessons were prepared, each designed to be studied for a period of approximately 20 minutes. Four lessons covered elementary scientific topics on disease, plants, weather, and fire. Four lessons on language dealt with contractions, homonyms, rhyming words, and antonyms. The two remaining lessons consisted of reading stories. All lessons were adapted from texts and workbooks designed for the third- and fourth-grade level.[1] In all cases, the lessons included written exercises.

A ten-minute test was prepared for each lesson, based on the specific content of the session. In all cases tests were similar in content to the exercises encountered in the text of the lessons. There were multiple-choice, fill-in, and matching questions. The tests provided a measure of the student's mastery of the content of each day's lesson.

Procedure

Overview

Subjects participated for ten consecutive weekdays over a two-week period. On alternate days, the fifth-grade tutor either taught the same third-grade tutee for 20 minutes (Tutoring Condition) or spent an equivalent period of time studying the material alone (Study Alone Condition). For the tutors, each session was preceded by a ten-minute period in which the material of the day's lesson was studied.

The younger children either were taught the day's lesson by their tutor (Tutoring Condition) or spent the same amount of time studying the material independently (Study Alone Condition). At the conclusion of each day's lesson, both the older and younger child were given a test on the content of the materials covered in that session.

The type of lesson was counterbalanced: subjects spent one day tutoring and the following day studying alone on the same general type of lesson. One-half of the subjects began the

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[1]We would like to thank the Steck-Vaughn Company for granting permission to duplicate a portion of You Find Out by Ware and Hoffsten.

first lesson in the Tutoring Condition, and the remaining half began in the Study Alone Condition. On the following day, subjects reversed conditions. This alternating pattern continued over the ten days, with all subjects participating in the Tutoring Condition five times and in the Study Alone Condition five times. On a given day, the same lesson was given to all subjects, half of whom were in the Tutoring Condition and half in the Study Alone Condition.

Fifth Graders (Tutors)

At the start of the experiment, fifth graders were told that on five of the ten days they would be "junior teachers" and would teach a lesson to one younger child of the same sex. Subjects were told that they would be similar to a "regular teacher," except that they would be teaching on a one-to-one basis. They were informed that on alternate days, when they would not be teaching, they would simply learn the lessons by themselves. Tutors were always told whether they would teach the third grader or study alone before receiving the lesson materials for each day.

Each session began with an eight-minute period to study the materials in the day's lesson. The subject then received a three-minute oral, free-recall test which was recorded by tape recorder. The subject was instructed: "Talk about today's lesson. Tell what you remember and what the material is about. Say whatever comes into your head." The subject was not permitted to refer to the text during this recall period. By this highly open-ended technique, we hoped to detect any difference between the Tutoring and Study Alone Conditions in the organization and structure of the material.

Immediately following the free-recall period, the subject either taught the lesson for a 20-minute period (Tutoring Condition) or studied the material alone (Study Alone Condition) for 20 minutes. Subjects were given complete freedom in organizing their tutoring sessions. At the end of each 20-minute session, both tutors and tutees were given the ten-minute objective test on the day's lesson.

Third Graders (Tutees)

Third-grade subjects were told at the beginning of the experiment that on alternate days they would either be taught by an older child (Tutoring Condition) or study a lesson independently (Study Alone Condition). In the Tutoring Condition, subjects were taught by their tutor for 20 minutes; in the Study Alone Condition, subjects simply were given the material and told to learn it by themselves during the 20-minute period. At the end of each 20-minute session they were given the same achievement test as administered to the fifth-grade subjects.

Design and Analysis

Separate scores were calculated for each ten-minute test administered after each day's lesson. Scores were standardized by lesson and grade to remove differences due to item and test variability and difficulty. Thus, results on each test were standardized at a mean of zero and a variance of one. These test scores measuring learning of the material constituted the dependent measure.

Data were available from five Tutoring Condition sessions and five Study Alone Condition sessions. Each subject served as his own control in a repeated measures analysis of variance design. Practice effect was a second factor included in the analysis to determine if performance varied as a function of participation in the program across the five sessions. Learning score data were analyzed separately for tutors and for tutees.

III
Results

Fifth Graders (Tutors)

An analysis of variance was performed on the fifth-grade tutors' standardized test scores. Results showed an interaction between condition (Tutoring or Studying Alone) and participation over the series of five sessions ($F = 4.41$, $p < .08$). Neither the condition nor practice main effect was significant.

An examination of the condition means presented in Figure 1 shows that subjects in the Tutoring Condition performed somewhat better overall than in the Study Alone Condition (.12 vs. -.12). In the first session, studying alone showed somewhat better results than tutoring, but the difference reversed direction over the two-week time period; during the last two sessions the Tutoring Condition was clearly superior to the Study Alone Condition. Orthogonal comparisons between the Tutoring and Study Alone Conditions by session disclosed a significant difference at session four (.45 vs. -.44, respectively; $F = 5.07$, $p < .04$) and at session five (.36 vs. -.35, respectively; $F = 4.53$, $p < .05$). Hence, by the end of the two-week period tutoring had resulted in significantly better performance than studying alone for the fifth-grade low achievers, a reversal of the initial trend of poorer performance for the Tutoring Condition than for the Study Alone Condition.

The fifth graders talked into a tape recorder in an open-ended manner after the first ten minutes of studying the lesson. Since they knew at the beginning of the session whether they were assigned to teach the material to the third grader or to study alone for the next 20 minutes, it was expected that the subjects' verbalizations would give a gross indication of any differences in cognitive organization of the material due to experimental condition. Content analysis of this free-recall material

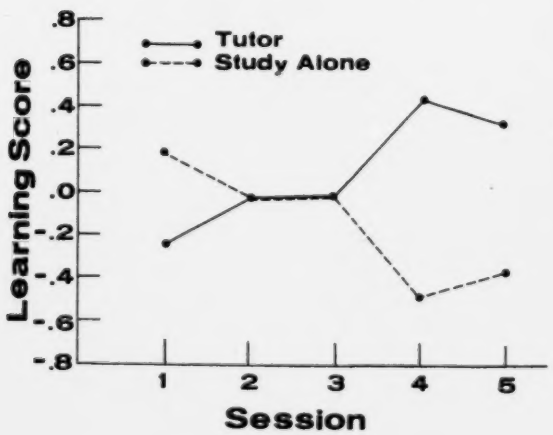

Fig. 1. Standardized scores for retention of material when studying alone versus tutoring (fifth graders).

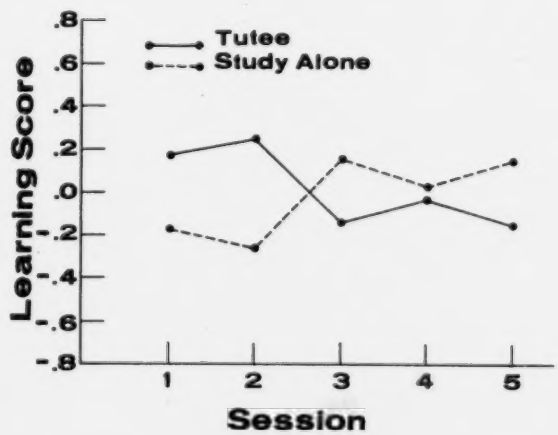

Fig. 2. Standardized scores for retention of material when being taught versus studying alone (third graders).

did not yield any clear results. A frequency count of the average number of words spoken in the free-recall test showed that subjects expecting to teach used a greater mean number of words (95.16) than subjects expecting to study alone (93.05). The difference was not, however, statistically significant.

Third Graders (Tutees)

Overall scores were slightly higher when third graders were taught by the older children than when they studied alone (.03 vs. -.02), as can be seen in Figure 2. The small overall difference did not approach significance in an analysis of variance. As with the fifth graders, there was an interaction between condition and practice over sessions ($F = 3.75$, $p < .10$). Performance in the Tutoring Condition showed a slight decrement over time, and performance in the Study Alone Condition improved somewhat with practice. Interestingly, this trend is in the opposite direction of the trend across sessions found for the fifth graders. Orthogonal comparisons between the Tutoring and Study Alone Conditions by session failed to show a significant difference between the two conditions at any of the five sessions. Thus, whether the third-grade tutees were taught by an older child or studied the material alone made little difference in their performance.

Comparison of Third Graders and Fifth Graders

A close comparison of the performance of tutors and tutees indicated a relatively greater change in learning scores as a function of experimental condition from the first to the last session for the fifth graders than for the third graders. To test statistically this differential effect, net change scores from first to last session for both experimental conditions were calculated for each subject. Results showed that mean difference over subjects from session one to five was +1.13 for the fifth graders, as compared to -0.71 for the third graders. The difference between the two means was statistically significant ($t = 2.24$, $p < .025$, one-tailed). Therefore, the difference in performance between studying alone and tutoring (or being taught) was significantly greater for the tutors than for the tutees. The tutors exhibited a significantly greater change in performance over the two-week period than did the tutees; thus, the differential impact of tutoring (or being taught) versus studying alone was more potent for the tutors than for the tutees.

IV
Discussion

Results of the present experiment support the hypothesis that acting as tutor for a younger child is a useful technique for enhancing the academic performance of low-achieving children. Over a period of two weeks, tutors' performance improved while they were enacting the role of teacher, yet performance deteriorated slightly during the same period of time when they were studying the material alone. Moreover, on the last two sessions performance in the Tutoring Condition surpassed the level of any previous performance in the Tutoring or Study Alone Conditions. As the tutors acquired more practice in enacting the role of teacher, they became increasingly successful in learning the material when tutoring.

One possible alternative explanation can be advanced for the present findings for the tutors. It is conceivable that the superior performance of the tutors in the Tutoring Condition might be due to the tutee's having actually taught material to the tutor. Although there was a two-year difference in grade and age between the tutor and tutee, the low-achieving tutor was only slightly more advanced than the tutee in level of reading achievement. A reversal in role seems unlikely, however, since the lessons were fairly well structured. The tutor was required to administer short exercises and questions to the tutee during the session, and the tutor had answer sheets in his possession. Periodic observation of the sessions by the experimenter did not disclose any instances of the tutee's teaching the tutor. Furthermore, if this alternative explanation were valid, one would expect that performance in the Tutoring Condition would be consistently better than in the Study Alone Condition, and that there would be no change in performance over time. Data showing positive change in performance over time and across conditions for tutors and only minor changes for tutees suggest that results were due to cognitive and motivational factors associated with enacting the role of teacher.

Of considerable theoretical importance is the determination of the locus of the enhanced performance due to tutoring. As one possibility, perhaps the mere expectancy of teaching someone else is sufficient to produce increased learning—thus, the tutoring situation itself might be of only secondary importance. The expectation of tutoring could have resulted in the child's exerting greater effort and working harder on the material while preparing the lesson. If the enhanced learning does occur prior to any interaction with the tutee, one would expect a difference between tutoring and studying alone in the free-recall phase administered after the initial preparation period. We did not observe any difference between conditions at this point, but our measure may have been too insensitive to detect any actually existing differences. Therefore, we cannot definitely rule out the possibility that the superiority of the tutoring occurs at the preparation stage and not during the teaching stage itself.

A second possibility is that the enhanced performance of tutors could have occurred as a consequence of interaction with the tutee during the course of the tutoring session. This seems a most sensible possibility, but we must be cautious and emphasize that no direct evidence from our experiment supports this supposition.

Third, regardless of the stage at which the greater initial learning of the tutors might take place, difference between the Tutoring and Studying alone Conditions might be due to differential memory or recall of material that was learned equally well in the two conditions. In other words, during the time of testing the material could have been remembered better by subjects in the Tutoring Condition than in the Study Alone Condition.

Future research is obviously needed to help clarify the specific point at which the positive effects of tutoring take place. It is conceivable that all three hypothesized processes are operative: learning may occur at both the preparation and tutoring stages, and differential recall may also exist. At this time we can say only that tutoring apparently produces better performance, but we cannot specify in detail the mechanisms responsible for the effect.

Turning now to the tutee, the data indicated little differential effect for the younger children between being taught and studying alone. Furthermore, the difference in performance between the two experimental conditions from the first to the last session was significantly greater for the tutors than for the tutees. There was a trend for tutees to perform worse over time when being taught which, if borne out in further research, reveals an interesting dilemma. Ironically, conditions that provide optimal benefits for low-achievers (tutoring) may be purchased at the expense of the tutees who might have profited more from spending the same amount of time studying the material by themselves. Low-achieving children may be poor tutors for other children. Tutees may therefore inevitably suffer when included in a tutoring program designed to help low-achieving tutors. We do not want to press this point too strongly in light of only suggestive results, but the trend observed in our data does point to the real possibility of detrimental effects for the tutee.

Several features of the present experiment should be noted in connection with making any generalization of the results. First of all, a diverse set of materials was used for tutoring: science, language, and reading lessons. The range and diversity of content increase the generality and generalizability of the present results. Secondly, although the number of individual subjects used was small, the repeated measures design was equivalent to the use of a far greater number of subjects tested only once, as has been the case in previous tutoring research. Furthermore, the fact that results were quite systematic and reached statistical significance in spite of the small number of subjects increases our confidence in the findings. Finally, it should be reiterated that our control condition—having subjects study the material for the same period of time as they spent tutoring—is much more rigorous than the control conditions typically used in tutoring research. It is more difficult to obtain positive effects from tutoring when results are compared to a condition in which subjects spend the same amount of time studying the material than when results are compared to the typical control condition in which subjects do nothing. These features of the experiment, plus the greater control of extraneous factors gained by conducting the study outside the school setting, should increase confidence in our findings.

In conclusion, enactment of the role of teacher by low-achievers seems to be a useful technique for increasing their learning. These results are not limited necessarily to low-achievers; it is likely that one may safely generalize these results to more academically-successful students. The positive effects of teaching on the tutor may be most dramatic, however, in cases where the student has experienced a history of failure in a school situation using the more traditional pedagogical methods.

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